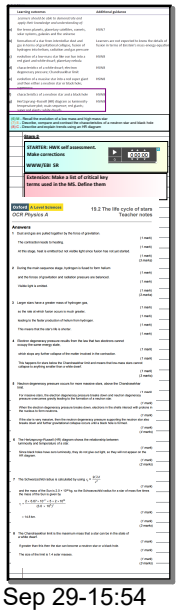

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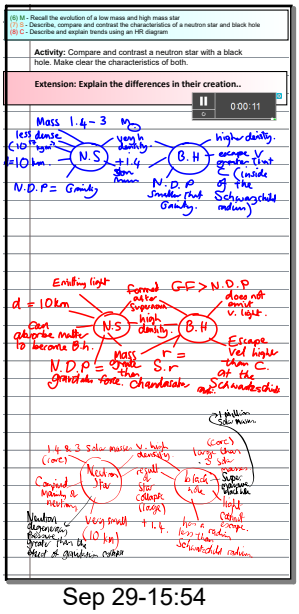

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(6) M - Recall the evolution of a low mass and high mass star
(7) S - Describe, compare and contrast the characteristics of a neutron star and black hole
(8) C - Describe and explain trends using an HR diagram

Mini plenary

As a class - piece together the evolution of a star. Each student adds a new piece of information in turn.

a Describe the formation of a star such as our Sun and its most probable evolution. In your answer you should make clear how the steps in the process are sequenced. *(6 marks)*

Extension: Contrast with a high mass star by stating the main differences.

ALLOW alternative wording
Maximum five out of six if the sequence of events is incorrect

Six from:

- Matter/gases/dust attracted by gravitational forces
- GPE converted to gain in KE (rise in temperature)
- Temperature high enough for hydrogen to begin fusion process
- Hydrogen/fuel runs out so core of Sun begins to collapse
- Hydrogen fusion continues in the outer layers of Sun
- Sun expands to form red giant
- Outer layers drift away/form planetary nebula
- Core forms a white dwarf/slowly cools and becomes dimmer

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Mini plenary - Extension answers

Extension: Contrast with a high mass star by stating the main differences.

2 Antares is a red supergiant star in the constellation Scorpius.

b The future evolution of Antares will be very different from that of our own Sun.
Describe how you would expect Antares to evolve.

..... (4 marks)

Four from:

- Temperature rises as super giant's core collapses
- Helium fusion/burning starts in core
- Supernova explosion occurs
- If mass of core is greater than Chandrasekhar limit a neutron star is formed
- If mass of core is greater than ~3 time mass of Sun a black hole is formed
- Other relevant points, for example, formation of heavier elements, fusion of elements up to iron, reference to Schwarz child radius

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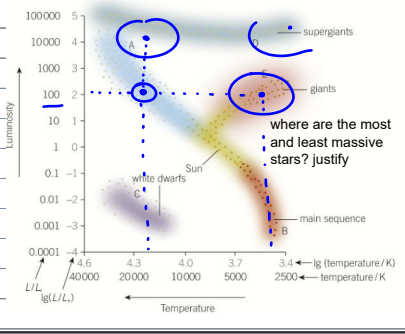
Hertzsprung - Russell diagrams HR diagrams

During the video, make notes about the HR diagram. Pay close attention to the scale/axis...

Ex: Consider the path out sun will take in the future. What changes occur in temperature and ~~luminosity~~?



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Hertzsprung - Russell diagrams HR diagrams

3 Figure 1 is an outline of the Hertzsprung–Russell (H–R) diagram.

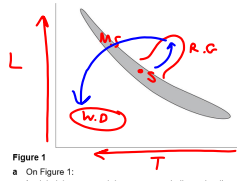

Figure 1

a On Figure 1:
i label the axes and draw arrows to indicate the directions of increasing values *(2 marks)*

ii name the region which is shaded ..... *(1 mark)*

iii mark the approximate position that currently represents the Sun. Label this point **S**. *(2 marks)*

b Also on Figure 1:
i mark and name positions in two other regions that the Sun is expected to occupy in the future. *(4 marks)*

ii draw a line showing the path that the Sun is expected to take over the next 5×10^9 years. *(2 marks)*

c Explain what is likely to be the final fate of the Sun.
..... *(2 marks)*

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Hertzsprung - Russell diagrams

HR diagrams

3 a i	Luminosity Temperature **and** clear indication that temperature increases towards the **left**	B1 B1	**ALLOW** absolute magnitude **ALLOW** values on axis or arrow to left
3 a ii	Main sequence	B1	
3 a iii	**S** in shaded region to the right of the midpoint	B1 B1	
3 b i	Red giants Suitable position above, at low temperature side White dwarfs Below shaded area, at high temperature side	B1 B1 B1 B1	 **ALLOW** ECF from **a i** **ALLOW** ECF from **a i**
3 b ii	Line drawn from **S** to red giant area Line continues down to white dwarf area	B1 B1	**ALLOW** ECF from **b i**
3 c	*References to:* After formation of white dwarf temperature decreases (significantly) Sun will cease to emit light/become a brown dwarf	 B1 B1	

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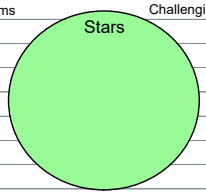
Plenary circle

Simple key terms Challenging key terms



Use 1-3 key terms to make a sentence that shows knowledge and understanding towards the HLOS

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